Appl. No 09/470,787
Amendment dated December 19, 2003

Amendments to the Claims:

This listing of claims will replace all prior version, and listings, of the claims in the application:

Listing of Claims:

1. (currently amended) A system for controlling traffic congestion within a buffered data switching network having a predetermined total buffer size, said system comprising:

(a) a packet counter for counting a number of newly arriving packets in the switching network; and

(b) calculation means for calculating an average queue size, $\overline{Q_t}$, at time t as

$$\overline{Q}_t = \overline{Q}_{t-1} \times (1 - Alpha) + Q_t \times Alpha$$

where Q_t is an instantaneous queue size, $\overline{Q}_{t-1}$ is the average queue size at time $t-1$, and $Alpha$ is a queue-length averaging parameter;

(c) threshold means for setting a packet-count threshold in accordance with the average queue size, for discarding a packet when the number of newly arriving packets reaches the packet-count threshold and when the average queue size exceeds a congestion threshold, and for resetting the packet counter when a packet is discarded.[[;]]

2. (cancelled)

~~3.~~ 2 (currently amended) [[A]] The system as in claim 1, wherein the calculation means includes means to regularly updates the average queue size using an exponential averaging technique.

~~4.~~ 3 (currently amended) [[A]] The system as in claim 1, wherein $Alpha$ is assigned a value between zero and one.

~~5.~~ 4 (currently amended) [[A]] The system as in claim 1, wherein a progressively increasing value of $Alpha$ is assigned with increasing level of traffic congestion.

~~6.~~ 5 (currently amended) [[A]] The system as in claim ~~5~~ 4, wherein the level of traffic congestion is indicated by the instantaneous queue size.

6 7. (currently amended) [[A]] The system as in claim 1, wherein the average queue size is updated after a predetermined number of cells have arrived since a previous packet discard.

7 ~~8.~~ (currently amended) [[A]] The system as in claim 1, wherein the average queue size is updated after a predetermined period of time has elapsed since a previous packet discard.

12 ~~9.~~ (currently amended) A system for controlling traffic congestion within a buffered data switching network having a predetermined total buffer size the data switching network having a queue with a queue size, said system comprising:

(a) a packet counter for counting a number of newly arriving packets in the switching network; ~~and~~

(b) calculation means for calculating an average queue size; and

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(c) threshold means for dividing the total queue size into a pre-selected number of N regions, for setting a packet-count threshold in accordance with the average queue size by using a descending staircase function $F(n)$, for discarding one of every $F(n)$ packets when the average queue size is in a buffer region n, $1 \leq n \leq N$ and for resetting the packet counter when a packet is discarded.

13 ~~10.~~ (currently amended) [[A]] The system as in claim 12 ~~9~~, further comprising means for detecting traffic congestion by setting a congestion threshold and comparing the average queue size with the congestion threshold, such that a congestion condition is indicated by the average queue size being equal to or above the congestion threshold, and an absence of congestion is indicated otherwise.

14 ~~11.~~ (currently amended) [[A]] The system as in claim 13 ~~10~~, wherein the packet is discarded only during the congestion condition.

15 ~~12.~~ (currently amended) [[A]] The system as in claim 13 ~~10~~, wherein the packet counter begins to operate when traffic congestion is detected, and halts operation when an absence of traffic congestion is detected.

16 ~~13.~~ (currently amended) [[A]] The system as in claim 17 ~~9~~, wherein the threshold means further includes means for dividing the total queue size into a pre-selected number of M regions, for high-priority traffic defining a high-priority congestion threshold, and the pre-selected number of N regions for low-priority traffic defining a low-priority congestion

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threshold, wherein the threshold means sets the packet-count threshold by using two functions $F(n,m)$ and $F(m)$, such that:

when the average queue size of high-priority traffic is above the high-priority congestion threshold and is in the buffer region m, $1 \le m \le M$, one of every $F(m)$ high priority packets is discarded; and

when the average queue size of low-priority traffic is above the low-priority congestion threshold and is in the buffer region n, $1 \le n \le N$, one of every $F(n,m)$ low priority packets is discarded.

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14. (currently amended) [[A]] The system as in claim ~~13~~, wherein the function $F(m)$ is a descending staircase function in the buffer region m, and the function $F(n,m)$, is a multivariable function of m and n, which has a descending staircase behaviour in the buffer region n for a fixed value of m.

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15. (currently amended) [[A]] The system as in claim 1, further comprising means for applying a priority scheme for discarding packets, which provides a differentiated service among service classes sharing a common buffer.

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16. (currently amended) [[A]] The system as in claim 1, wherein the threshold means uses a look-up table.

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17. (currently amended) [[A]] The system as in claim 1, wherein the threshold means sets the packet-count threshold upon arrival of a new packet into the system.

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18. (currently amended) [[A]] The system as in claim 1, wherein the threshold means sets the packet-count threshold upon departure of a packet from the system.

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19. (previously amended) A method for controlling traffic congestion within a buffered data switching network having a predetermined total buffer size, said method comprising the steps of:

(a) counting a number of newly arriving packets;

(b) calculating an average queue size wherein the average queue size at time t is calculated as:

$$\overline{Q}_t = \overline{Q}_{t-1} \times (1 - Alpha) + Q_t \times Alpha$$

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where Q_t is an instantaneous queue size, $\overline{Q}_{t-1}$ is the average queue size at time $t-1$, and *Alpha* is a queue-length averaging parameter;

(c) setting a packet-count threshold; and

(d) discarding a packet and ~~resetting the packet count~~ restarting the counting of newly arriving packets, when the number of newly arriving packets reaches the packet-count threshold and the average queue size exceeds a congestion threshold.

20. (cancelled)

21. (currently amended) [[A]] The method as in claim 18, wherein the calculating step regularly updates the average queue size using an exponential averaging technique.

22. (currently amended) [[A]] The method as in claim 18, wherein *Alpha* is assigned a value between zero and one.

23. (currently amended) [[A]] The method as in claim 18, wherein a progressively increasing value of *Alpha* is assigned with increasing level of traffic congestion.

24. (currently amended) [[A]] The method as in claim 23, wherein the level of traffic congestion is indicated by the instantaneous queue size.

25. (currently amended) [[A]] The method as in claim 19, wherein the average queue size is updated after a predetermined number of cells have arrived since a previous packet discard.

26. (currently amended) [[A]] The method as in claim 19, wherein the average queue size is updated after a predetermined period of time has elapsed since a previous packet discard.

27. (currently amended) A method for controlling traffic congestion within a buffered data switching network having a predetermined total buffer size, said method comprising:

(a) counting ~~the~~ a number of newly arriving packets;

(b) calculating an average queue size;

(c) dividing the predetermined total buffer size into a pre-selected number of N regions;

(d) setting a packet-count threshold in accordance with a descending staircase function $F(n)$; and

(e) discarding one of every $F(n)$ packets and ~~resetting the packet count~~ starting the counting of newly arriving packets, when the average queue size is in a buffer region n, $1 \le n \le N$.

28. (currently amended) [[A]] The method as in claim 27, further comprising a step of detecting traffic congestion by setting a congestion threshold and comparing the average queue size with the congestion threshold, such that a congestion condition is indicated by the average queue size being above the congestion threshold, and an absence of congestion is indicated otherwise.

29. (currently amended) [[A]] The method as in claim 28, wherein the packet is discarded only during the congestion condition.

30. (currently amended) [[A]] The method as in claim 28, wherein the packet counter begins to operate when traffic congestion is detected, and halts operation when an absence of ~~traffic congestion is detected.~~

31. (currently amended) [[A]] The method as in claim 27, wherein the step of dividing the predetermined total buffer size includes dividing the predetermined total buffer size into both a pre-selected number of M regions, for high-priority traffic defining a high-priority congestion threshold, and a pre-selected number of N regions for low-priority traffic defining a low-priority congestion threshold, wherein the step of setting the packet-count threshold sets the packet-count threshold by using two functions ~~$F(n,m)$~~ $F(n,m)$ and $F(m)$, and wherein the step of discarding includes discarding one of every $F(m)$ high priority packets when the average queue size of high-priority traffic is above the high-priority congestion threshold and is in the buffer region m, $1 \le m \le M$, and discarding one of every ~~$F(n,m)$~~ $F(n,m)$ low priority packets when the average queue size of low-priority traffic is above the low-priority congestion threshold and is in the buffer region n, $1 \le n \le N$.

32. (currently amended) [[A]] The method as in claim 31, wherein the function $F(m)$ is a descending staircase function in the buffer region m, and the function ~~$F(n,m)$~~ $F(n,m)$ is a multivariable function of m and n, which has a descending staircase behaviour in the buffer region n for a fixed value of m.

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~~33.~~ 25. (currently amended) [[A]] The method as in claim ~~19~~ 18, further comprising a step of applying a priority scheme for discarding packets, which provides a differentiated service among service classes sharing a common buffer.